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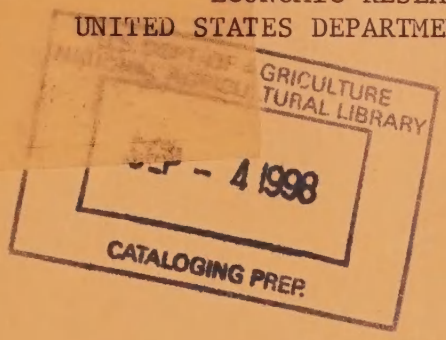
ECONOMIC RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE



CURRENT PROGRAM
and
PROGRESS REPORT

of the

NATURAL RESOURCE ECONOMICS DIVISION

Fiscal Year 1970

PREFACE

This progress report is primarily a tool for use of scientists and administrators in program coordination, development and evaluation. The summaries of progress include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff and others having a special interest in the development of public agricultural research programs.

This progress report was compiled in the Natural Resource Economics Division, Economic Research Service, U. S. Department of Agriculture, Washington, D.C. 20250.

November 1970

INTRODUCTION

The Department's program of natural resource economics research is concerned with the use, conservation, development, and control of natural resources, and the contribution of natural resources to local, regional, and national economic growth. Major responsibility for conducting this research rests with the Natural Resource Economics Division. The Division's program of studies includes research, planning, and technical consultation and services on economic and institutional problems and policy related to natural resources.

The program is headquartered in Washington, D.C. Studies are carried out in Washington and at field locations. At the close of the reporting period, the structure of the Division was changed, and currently is made up of two Branches located in Washington, D.C., and six Regional Resource Groups.

Progress in each of three major areas of work from July 1, 1969, through June 30, 1970, is summarized in this report. The first of the three areas discussed is natural resource economics studies, defined here as research projects documented in the Current Research Information System (CRIS). The studies are discussed under two subsections--resource economics and environmental economics. Publications released and Research Work Units active during the year are listed at the end of the subsections.

The second major area of work reported is natural resource planning studies. The largest part of the work involves participation with other Federal agencies in comprehensive water and related land resources planning under the overall guidance of the Water Resources Council. The Division's river basin planning program is carried out principally in field locations under the direction of the Regional Resource Groups. Following the summary of progress in these studies is a list of reports and documents prepared during the year. Washington-based participation in river basin planning consists principally of interagency coordination, data, and methodology support for the field program, and projections of national and regional demands and supplies of agricultural production. Program assistance and economic studies also are provided in support of the Department's Resource Conservation and Development Program. Participation in all of these planning studies is guided by annual work plans prepared under a Memorandum of Agreement between the Soil Conservation Service, Forest Service, and Economic Research Service in the case of river basin planning, and a Memorandum of Agreement between SCS and ERS in the case of RC&D assistance.

The third major area reported is program evaluation and related policy studies. Activities reported include watershed investigations, carried out for the Soil Conservation Service under provisions of an annual plan of work, and water resource project analysis and legislative review. Several noncontinuing studies and major support activities requiring more than nominal staff time also are reported.

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I. NATURAL RESOURCE ECONOMICS STUDIES

RESOURCE ECONOMICS

Objectives

Major objectives of the program are to:

Maintain economic inventories of the Nation's land and water resources; identify trends and changes in use over time and between geographic areas; and develop new sources of data on the uses, supplies, and emerging requirements for land and water resources;

Evaluate alternative means for conserving and developing land and water resources;

Analyze agricultural and nonagricultural demand for land and water resources, and determine values of land and water in agricultural and competing uses; and

Analyze the role of natural resources in regional and national economic growth, and maintain estimates of resources needed to meet long-term demand for agricultural production and urban expansion.

Summary of Progress

1. Several studies produced data and analyses relating to national uses and supplies of land and water. The summary of annual cropland uses shows cropland used for crops totaled 334 million acres in 1969, down 5 million acres from 1968 but one percent above the record low in 1966. During the year, a study of cropland trends since World War II was completed and published. From 1944 to 1964, national cropland acreage showed a net decrease of 27 million acres. The total decrease in cropland acreage was 54 million acres in 2,204 counties, but this was offset in part by cropland increases of 27 million acres in 868 counties. Much land is suitable for reclamation and crop use, particularly in the Delta and Southeast Regions.

   A study of major land use and land use changes for the Mississippi alluvial area neared completion. Preliminary estimates of forest land conversion to cropland from 1950 to 1969 was 3 million acres. This and other estimates of land use change in the area are being obtained from comparative analysis of airphotos taken in 1950 and 1969 of a sample of tracts.

   Interest in nonagricultural uses of rural land continues to be strong. The total area devoted to urban and other intensive sepcial uses was estimated to be 58 million acres in 1969, compared to 55 million acres in 1964. The area is still less than 3 percent of the total land area, however. Strip mining of coal disturbs an increasing rural acreage each year. Surface mining accounted for 37 percent of total coal produced in 1968, which is well above the 22 percent in 1951. Airphoto analysis shows minimal restoration of abandoned coal mines.

A limited amount of irrigation data is now collected annually by the Statistical Reporting Service and will be incorporated in annual statistics of land use, as well as being used to improve estimates of agricultural water use. The principal agricultural water use is for irrigation. Most estimates of water use for irrigation are derived from acreage data and average use rates, rather than from direct measurements. While this approach has been reasonably satisfactory in the case of irrigation, estimates of water needs and uses for such purposes as household and farm uses are not adequate. Discussions were held with staff of the Farmers Home Administration and the Public Health Service regarding the possibilities of using program information to improve estimates of rural water use.

2. A Colorado study is examining how water conservation on farms affects streamflow. Streamflow and water diversion data for selected streams in Colorado and Wyoming have been assembled for several years and will be analyzed in a simulation model of irrigation water use. It is expected that this information will be of use in estimating the magnitude and incidence of benefits from increasing streamflow through improved water management on individual farms.

   The simulation model used for the Colorado study was discussed in detail in previous progress reports. It was developed in collaboration with the Graduate School of Public Administration at Harvard University. The model simulates decisions by farmers or organization officials when water supplies change. Irrigation systems and water delivery practices in several areas have been compared. This work has been completed and a report is being prepared.

3. Research on the economics of conservation practices and water management was continued in Iowa, North Dakota, and Georgia. The Iowa study is focused on the costs and benefits of grass backslope terraces. Analysis of yield data from the Treynor experimental watershed in southwest Iowa indicates that grass backslope terraces may be uneconomic. Research findings in North Dakota on the economics of level benches were published during the year. Level benches do lead to increased yields of alfalfa and other forage crops, although profitability of the practice depends on topography. Level benches could be profitable for wide benches on gradual slopes but as steepness of slope increases, only narrow benches are profitable. Plans were made to study economic aspects of artificial barriers for controlling snow deposition and soil erosion. The study will be conducted in cooperation with ARS and North Dakota State University scientists. Shelterbelts have been selected for study and sampling procedures arranged for obtaining snow measurements and crop yields in protected fields. Another study is being planned which will evaluate local economic impacts of completed multipurpose water resource projects in the Northern Plains.

4. An analysis of specialized weather services in Indiana was completed during the year and a manuscript prepared. Findings of the study were based on analyses of survey data obtained from farm operators and mass media subscribers to the ESSA Weather Wire. Farm operations for which specialized weather information is most valuable include haying outlook, spraying conditions, harvesting conditions, and field conditions. Use of the

information by farm operators was: Haying outlook--79 percent; spraying conditions--51 percent; harvesting conditions--73 percent; and field conditions--68 percent. Farmers placed the highest value on weather information for spring farm operations.

5. Different levels of investment for sediment management on a 117-square-mile watershed in northern Mississippi were investigated for a study of the economics of sediment control. The study is being conducted in cooperation with ARS scientists at the U.S. Sedimentation Laboratory in Mississippi. The influence of land use changes and of water and sediment retention structures on sediment yield were compared for each of the 11 sub-watersheds within the major watershed. Land use in the watershed falls into four classes--cultivated, idle, forest, and pasture. Cultivated and idle land tends to promote erosion and sediment production, while forest and pasture land limits it. Sediment yields for sub-watersheds during 1960-66 ranged from 1.35 to 8.01 tons per acre per year. Sediment yield for the entire 117-square-mile watershed averaged 4.27 tons per acre annually.

6. Two studies of urban demand for agricultural land were completed during the year. One of the studies, done in cooperation with the Minnesota Experiment Station, examined factors affecting land development in a suburban area. One finding was that size of holding on death of a landowner does not influence the probability of the land being developed. Factors that do make land attractive for development are sewer availability, low sewer costs, and access to shopping areas. Land with only two of these characteristics showed probabilities of being developed of .2 to .3. However, land with all three characteristics had a development probability of .8.

   Research in Hawaii on factors affecting agricultural land values was completed and findings were published. Also completed and awaiting publication were a study of preferential assessment of agricultural land in New Jersey, and a study of economic effects of changes in the local area near the Sutton Reservoir in West Virginia.

7. Studies of the impact of water resource development are being carried on in Minnesota, Pennsylvania, and Oregon. The Minnesota study is estimating the value productivity of water in agricultural uses for major agricultural regions. Production functions have been derived for one region. In Oregon, the relationship between farm output and water resource development is being measured for homogenious farming regions in Washington, Oregon, and Idaho. Water resource development is defined to include irrigation, drainage, flood control, and water conservation practices. The study was near completion at the year's end. The Pennsylvania study is concentrating on analysis of use and costs of water delivered by municipal water utility organizations, and patterns of water use and cost in relation to industrial growth. The study is at an early stage. Some secondary data have been obtained from State agencies.

Major Service Activities

Project coordination was provided for North Central Region Research Project NC-57, Economic and Legal Factors in Providing, Using, and Managing Water Resources in Agriculture. The project will expire at the end of the current year. A termination report is to be prepared. Other service activities have included providing information and analyses in response to Congressional requests and inquiries from other Federal agencies and the general public. Some support and service activities required more than normal staff time to complete; these are described in more detail in Part III of this report.

Future Plans

A review is being made of the Division program, including the research mission and issues and problems needing research, as a basis for determining priorities and new directions for the program. Pending completion of the review, it is not feasible to identify specific changes in program direction. General changes expected include greater emphasis on study of supplies and uses of natural resources for nonagricultural purposes. A clearer distinction will be made than previously between basic inventory and methodology development studies on the one hand, and problem-oriented natural resource studies on the other hand. This has several implications, but among the more important is that both the regular research program and that part of the program funded by and carried out in support of other agencies' programs can more easily be related to common or like sets of resource problems than previously.

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Work Project and Work Unit Number	Title	Location
	LAND RESOURCES	
NRE 1 (Rev.)	Land Classification and Inventory	
1-1-54-00	National land use inventory	Washington, D.C.
1-3-33-01-X1	Development of a land-use classification system utilizing simulated satellite imagery	Ithaca, N.Y.
	WATER RESOURCES	
NRE 2	Water Use and Management	
2-6-54-00	Economic inventory of agricultural water use in the United States	Washington, D.C.
2-7-54-00	Climatological factors affecting water use in agriculture	Washington, D.C.
2-8-16-01	Technology and economics of conservation	Ames, Iowa
2-9-54-00	Role of water in the pattern of regional economic development	Washington, D.C.
2-10-06-01	Economics of western streamflow accretions	Fort Collins, Colo.
2-11-11-03	Economic analysis of agricultural water management in the southeast	Atlanta, Ga.
2-12-24-01	Value productivity of water in agriculture	St. Paul, Minn.
2-13-52-01	Irrigation trends and potentials in the North Central States	Madison, Wis.
2-14-10-01-X1	Irrigation and other production relations in Florida citrus enterprises	Gainesville, Fla.
2-15-36-01	Economics of water management techniques in North Dakota	Fargo, N. Dak.
2-16-44-01-X1	Economics of water management techniques in South Dakota	Brookings, S. Dak.
2-17-36-01-X1	Economics of irrigation and water resource development in North Dakota	Fargo, N. Dak.
2-18-39-01	Economics of irrigation, drainage and related problems in the northwest	Corvallis, Oreg.
2-19-46-12-X1	Economics of water management on the Texas High Plains	Lubbock, Texas

Work Project and Work Unit Number	Title	Location
NRE 2 (cont'd)		
2-20-12-01	Value of irrigation water for the production of sugar cane	Honolulu, Hawaii
2-22-06-01	Economics of alternative routines for delivering irrigation water	Fort Collins, Colo.
2-23-10-01-X1	Economics of irrigation and water resource development in Florida	Gainesville, Fla.
2-24-15-01	Water resource economics and specialized agricultural weather service programs	Lafayette, Ind.
2-25-25-04	Economics of sediment control on a mixed watershed in north Mississippi	Oxford, Miss.
2-26-40-01	Water resources as a determinant of economic growth in Pennsylvania	University Park, Pa.
NRE 5 (Rev.)	Economics of Land Conservation and Development	
5-1-54-00	1/ Impacts of urban growth on rural land use	Washington, D.C.
5-4-12-01	Factors affecting agricultural land values in Hawaii	Honolulu, Hawai
5-5-24-01	Economic supply of land for urban expansion	St. Paul, Minn.
5-6-31-01-X1	Agricultural land use and values in New Jersey	New Brunswick, N.J.
5-7-51-01	Reservoir impacts on land use and values in Appalachia	Morgantown, W.Va.

1/ Progress is reported with environmental economics studies.

Objectives

Major objectives of the program are to:

Maintain economic information on changes in quality of water, air, and land in rural areas, and the source of pollutants and type of human activity causing damage to the environment;

Analyze effect of resource institutions and public policies and programs on resource use and environmental quality;

Conduct economic and legal studies of property ownership, tenure arrangements, and water law, and evaluate alternative arrangements for holding and transferring land ownership and water rights;

Analyze economic aspects of development, use, and management of outdoor recreation resources; and

Develop improved procedures for natural resource planning and for evaluating environmental effects and economic costs and benefits of alternative resource plans.

Summary of Progress

1. Several studies were directly concerned with environmental problems and economically feasible corrective measures or institutional adjustments needed. A case study of water pollution caused by runoff from cattle feedlots is being carried out by the Nebraska Agricultural Experiment Station under a research contract. Papillon Creek Watershed was selected for studies based on proximity of the Watershed to Omaha and the existence of over 700 feedlots in the watershed. Preliminary evidence is that over 80 percent of the feedlots pose a stream pollution threat. It appears that future feedlot relocations will result as much or more from urban encroachment as from actions to reduce water pollution.

   A comprehensive report on water use law and administration in Wisconsin was completed. Included are analyses of the common law of water pollution, shoreland ownership along the part of the Wisconsin River where most of the paper mills are located, activities of the Wisconsin Department of Natural Resources and conservation wardens in controlling water pollution, possible constitutional limitations on proposed State operation of water pollution abatement facilities, alternative arrangements to guide State operation, and the constitutionality of effluent charges.

2. Implications of flood plain, conservation, and recreation zoning for the Small Watershed Program were summarized in a manuscript intended for publication. The study analyzes organizational and decision-making aspects of separate measures for resource plan implementation, and reviews zoning enabling legislation and zoning ordinances as they might relate to the watershed program. Several other manuscripts on zoning and land use controls

were being prepared or were completed. These include a report on rural zoning enabling legislation in the United States, use of natural resource information in land use planning, regulations for aesthetics in rural areas, and soil classification for use in resource planning. A paper dealing with implementation of land policy was published. It discussed external forces that affect zoning, such as government financing, fragmented governmental decisionmaking and land speculation, and political and constitutional limitations that are basic to the zoning process.

3. The final report of a contract study of settlement problems of large farm estates in Iowa was received. The report notes that with continuing growth in farm size and assets, better farm estate planning will be required to avoid unnecessary estate settlement and tax costs and to facilitate transfer of the farm as a going concern between generations. The study found no legal obstacles to accomplishment of farmers' estate planning objectives, but suggests that continuing educational efforts may be needed to assist local professionals in dealing with the increasing financial and technical complexity of estate planning for large-scale farm operators. The study also noted conflicts between some farmers' customary attitudes toward estate planning and the need to make plans based on sound business decisions.

   Preliminary field study of land recording practices in Dane County, Wisconsin, was initiated. A questionnaire for a national mail survey of county officials was prepared in cooperation with the National Association of County Recorders and Clerks. The survey is designed to determine present recording practices, personnel requirements, and operating costs. Related study of property systems continued, and was reported in a manuscript in which are discussed the conflicts between individual privacy and data needs for a comprehensive information system of land rights.

4. Several studies are being made of Eastern water law. A comprehensive report on water-use law and administration, published by the University of Wisconsin, was released soon after the end of the reporting period. It analyzes court decisions and the role of different levels of government concerning water use, including the actual administration of a number of statutory permit systems. Another study which examined functions and powers of the North Dakota State Water Conservation Commission concluded that the agency has an important role in regulating water use. The report suggests that greater emphasis might be given to different kinds of water use, development, or conservation in different areas of the State. Other work completed included a historical summary of Federal water policies and agencies from 1800 to 1960, material to supplement a national bibliography of publications on State water-rights laws, and material for a bibliography on Federal-State jurisdictional issues.

   The study of Western water-rights laws was mostly completed at the end of the year. Remaining efforts will be to complete revision and prepare the manuscripts for publication.

5. Two studies of recreation enterprises were published in cooperation with the University of Wisconsin. These concerned privately owned fishing enterprises, and characteristics of vacationers at Wisconsin resorts. Fishing enterprises including boat rentals and fee fishing enterprises generally

were seasonal, part-time enterprises and half of the operators had other, full-time jobs. Average annual return for all fishing enterprises was $2,183. Of 843 groups vacationing at Wisconsin resorts, 56 percent were from Illinois, 31 percent from Wisconsin, and 13 percent from all other States. Practically all travelled by auto. Groups of two or four people were most typical. Teenagers and persons over 65 were relatively rare. Fishing was the most important recreation activity, followed by swimming and boating.

Another study at Wisconsin applied industrial organization theory in an analysis of the recreation industry. The analysis was based on a survey of a sample of 10 types of outdoor recreation enterprises common in Wisconsin. Most of the enterprises studied have high investment and low returns. Management problems were identified and included, among others, ineffective promotion efforts and failure of recreation firms to carry out collective marketing activities.

An analysis was begun on the use made of public access provisions of the Agricultural Conservation Program in selected States, and an extramural study of the economic impact of a State park on nearby towns was initiated by the New Hampshire Agricultural Experiment Station.

6. Some research has focused on the process and procedures of natural resources planning. One study, carried out in support of programs of the Bureau of Land Management, has consisted of jointly developing and testing a system for comprehensive planning of lands under the management of BLM. The planning system works well under test conditions, but experience indicates the need for an economic information system that can be applied in the field to generate needed economic data.

   Another study is examining different types of new communities and the social, economic, physical, and political problems of planning and developing new communities. Analysis of results of a survey indicated an average size of 7,500 acres for new towns, compared with 4,300 acres for planned residential communities and 1,500 acres for residential subdivisions. A case study of rural to urban (new town) land use changes in Columbia, Maryland, includes identification and measurement of former land uses on 107 parcels totaling nearly 14,000 acres.

Major Service Activities

Routine service activities included providing information and analyses in response to Congressional requests and inquiries from other Federal agencies and the general public. Some support and service activities required more than nominal staff time to complete. These are described in Part III of this report.

Future Plans

Increased attention will be given identification and analyses of environmental problems and economically feasible adjustments needed for environmental improvements. Greater effort will be made to obtain and compile economic information on environmental quality as a basis for analyses, and to more adequately service

inquiries relating to quality changes. Improved procedures for natural resource planning and for evaluating costs and benefits are needed, and it is expected that more studies will be undertaken in this area.

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Work Project and Work Unit Number	Title	Location
	RESOURCE INSTITUTIONS	
NRE 3	Resource Institutions	
3-1-05-01	Legal aspects of water rights in the West	Berkeley, Calif.
3-2-25-04-X1	Legal and institutional factors affecting water use and development in Mississippi	University, Miss.
3-2-52-01	Legal aspects of water rights and water quality in eastern States	Madison, Wis.
3-2-54-00	Legal aspects of water rights in the East	Washington, D.C.
3-3-54-00	Analysis of land use control measures	Washington, D.C.
3-4-06-01-X1	Analysis of local and State organization for water resource development, Arkansas Valley, Colorado	Fort Collins, Colo.
3-4-54-00	Economic appraisal of local soil, water and other resource organizations	Washington, D.C.
NRE 4	Land Tenure	
4-1-37-01-X1	Assess rural land records for possible adaptation to automated record systems	Columbus, Ohio
4-1-54-00	Development and analysis of basic farm tenure information	Washington, D.C.
4-2-16-03	Appraisal of economic aspects of land tenure laws	Iowa City, Iowa
4-3-54-00	Maintenance of current information of contractural agreements	Washington, D.C.
4-5-06-01	Ownership and management arrangements for control and use of resources in the Western States	Fort Collins, Colo.
4-6-52-01	Incidence of benefits and costs of county and other local land record systems	Madison, Wis.
NRE 6	Resource Income Distribution	
6-1-06-01	Analysis of the Great Plains Conservation Program	Fort Collins, Colo.
6-1-54-00	Analysis of the Great Plains Conservation Program	Washington, D.C.

Work Project and Work Unit Number	Title	Location
NRE 6 (Cont'd)		
6-6-54-00	Effects of technical, institutional and economic forces on resource income distribution	Washington, D.C.
6-7-06-01-X1	Technical and institutional forces affecting results of investments in natural resource development	Fort Collins, Colo.
	ENVIRONMENTAL ECONOMICS	
NRE 7	Outdoor Recreation and Natural Beauty	
7-2-52-01	The economic impact of rural recreational enterprises	Madison, Wis.
7-3-52-01-X1	The economic impact of rural recreational enterprises	Madison, Wis.
7-4-54-00	Recreational use of natural resources	Washington, D.C.
7-6-30-01	Economic impacts of Pawtuckaway State Park on four New Hampshire towns	Durham, N.H.
NRE 8	Quality of Natural Resources	
8-1-54-00	Economic effects of pesticides and other wastes on natural resource quality	Washington, D.C.
8-2-28-01-X1	Economic impacts of water pollution control programs on cattle feedlots	Lincoln, Neb.

II. NATURAL RESOURCES PLANNING STUDIES

COMPREHENSIVE WATER RESOURCES PLANNING

Objectives

Studies undertaken by the Natural Resource Economics Division are coordinated with survey efforts of the Soil Conservation Service, the Forest Service, and other Federal Departments, and are carried out under the general guidance of the Water Resources Council.

Major objectives of the planning studies are to:

Analyze and project economic activity in the agricultural and related sectors of the economy;

Project the demand, supply, and use of land resources for agricultural and other rural purposes;

Analyze agricultural and rural water problems as they relate to the volume, composition, and value of production, employment, and levels of income in affected communities;

Assess agricultural and rural needs for water and related land resource development; and

Appraise the economic effects and consequences of development alternatives on the agricultural and related sectors of the economy, and on dependent rural communities.

Summary of Progress

1. Great Plains:

Agricultural activity in the Souris-Red-Rainy River Basin was analyzed for the Socio-Economic Work Group. Materials prepared include a description of the agricultural economy of the region, the baseline national disaggregation of food and fiber requirements, and land inventory summaries. Working with the Office of Business Economics, Department of Commerce, agricultural employment was projected to decline from 65,000 currently to 22,300 in 2020, while annual farm earnings per agricultural employee were projected to increase from $3,800 currently to $23,300 in 2020.

Results of the programming analysis suggest that, without further resource development, the region could meet food and fiber requirements by using all reserve idle cropland in 1980, with 1.4 million acres of reserve idle cropland in 2000, and 2.4 million acres of reserve idle cropland in 2020.

The work group proposed to measure the effect of resource development on the economy by four classifications: (1) primary generation, (2) primary displacement, (3) secondary generation, and (4) secondary replacement.

ERS was responsible for estimating the primary generation effects of resource developments in the agricultural sector, but because of lack of data the analysis was confined to public irrigation development, drainage, and the use of reserve idle land.

A programming analysis is being made for Nebraska in order to simultaneously view agricultural development needs and potentials for the 13 subbasins in the Nebraska Type IV studies. Requirements, bounds, and limits were prepared and a feasible 1980 solution was obtained. The 1980 food and fiber requirements would be obtained with a reduction of 2.3 million acres of nonirrigated cropland and about 100,000 acres of irrigated cropland. An added feature of this analysis was that crop requirements were ranged out to successively higher levels, the last of which completely utilized the land resource. These ranged-out solutions are useful in evaluating the sensitivity of subbasin patterns of land use and associated output to successively higher levels of State product requirements, and indicate the patterns of land use and associated output by subbasin if the State were to realize its full production potential without further resource development. These analyses will be used in conjunction with other analyses in the preparation of reports on the Type IV studies.

2. North Central:

A study in the Wabash River Basin was undertaken to estimate flood damages from land values. One of the most difficult economic problems encountered in evaluating a flood control project is to determine expected benefits to agricultural lands, since flood damages are affected by several factors including season, depth and duration of flooding, land use, and crop susceptibility to water damage. In an attempt to find a better way to evaluate these damages, a study was made of relative prices for flood-plain and upland fields in the Wabash River Basin. Analysis of data from over 900 sales of farmland in eight Indiana counties disclosed that farmers generally do take flood risk into account in pricing flood-plain lands and, where the risk is well defined, the price discount is very close to that derived from engineering studies. There appears to be a tendency for landowners to capitalize the expected benefits from future flood control into land values during the early stages of project planning or development. This tendency acts to restrict the applicability of a "land value" alternative to conventional benefit estimation procedures.

The Muskingum Basin study area is composed of 19 counties having all or a significant portion of their area lying within the Muskingum River Basin, plus 4 counties on the east whose tributaries drain directly into the Ohio River. These additional 4 counties were included at the request of the State of Ohio, to facilitate preparation of its water development plan for that 23-county area. This diverse area includes the large urbanized area of Canton and a portion of Akron on the north, productive cornbelt type land on the west, and rolling to hilly pasture and hayland in the southeast. Dairy farms characterize the agriculture in the northern counties, while livestock and cash grain farms contribute most of the agricultural income in counties in the west. Cow-calf operations and part-time farming characterize the southeastern area. Preliminary analyses indicate that the rural farm population is likely to decline from 128,000 in 1960 to about 84,000

by 1980. No significant shifts in the location of agricultural production are anticipated by 1980. Part-time farming is expected to remain popular in the southeast. The interstate highway links these areas to industries in the town of Marietta on the Ohio River.

3. Northeastern:

A study of urbanization of land in the North Atlantic Water Resource Region from 1950 to 1960 found that about 21 acres of previously rural land were taken for urban-related uses for each 1,000 increase in population. Of this land, about 86 percent went for residential purposes and the rest for industrial, commercial, institutional, recreation, and airport uses. Almost half of the land had been used for cropland prior to conversion and about a fourth had been in forest. In the area as a whole, about 24 percent of the rural land was cropland and 60 percent was forest. Over 80 percent of the land converted to urban use was in land use capability classes I, II, and III. These three classes include the better lands that have the fewest management and conservation problems and which are best suited for crop production. Overall, only 42 percent of the rural land in the study area was in these three classes.

An economic evaluation was made of environmental quality improvement through land use changes in the heavily populated Northeast. The study found that a land-use pattern that fulfilled visual quality standards recommended for the region would cost an average of $4.34 more per acre than for land use that would result in the most efficient agricultural production. An additional 164,000 acres of cropland and pasture, 16.7 million additional acres of forest land, and 752,000 additional surface acres of water would be needed to reach the environmental objective and also maintain the current output of food and fiber. In spite of anticipated urbanization of 17.4 million acres in the region by the year 2020, sufficient land is available to meet production requirements, environmental enhancement, and development. What is required, however, is sound land use planning and management in order to achieve all of the objectives.

A report on the Economics of Agricultural Development in the James River Basin in Virginia is in draft form. The report describes pertinent relationships between the agricultural and other sectors of the economy of the James, and includes projections of land use in 1980, 2000, and 2020. Projections are based on an assumed level of future demands for food and fiber, and are consistent with least-cost methods of production. Projected production of timber products in 1980 could be achieved with about one-fourth of the acreage that was in forest in 1964. Crop production also could be attained on fewer acres in 1980 than in 1964, but substantial increases in pasture acreage were projected. A second set of projections for 1980 was based on the same assumed levels of production, but included higher standards for visual quality (scenery). These standards could be met with existing land and water resources, but at a substantial increase in costs.

4. Northwestern:

As a part of the Columbia-North Pacific Framework Study, ERS analyzed the agricultural and food-processing sectors of the economy. Preliminary findings of the study indicate that agriculture is an important industry in the region. Agriculture is expected to continue as an important industry in the future, with output increasing nearly two and a half times by the year 2020. The production of all crops will increase by about 160 percent, and all livestock and poultry, 131 percent. By 2020, the value of all crops produced (in constant dollars) will represent about 64 percent (60 percent in 1964) of the total value of production, and livestock and poultry, 36 percent (40 percent in 1964). Increases in output by subregions will range from twofold to threefold by 2020. Employment, on the other hand, will decrease substantially in the region and subregions by 2020. Projected increases in agriculture output will be accompanied by changes in the structure of the agricultural industry. Substitution of capital inputs for labor and land, as well as shifts in the organization and use of resources, will continue. Further reductions in the numbers of farms are in prospect as smaller farms are consolidated into larger commercial farms. Increased productivity per worker and per acre will be influenced primarily by additional resource development, such as irrigation and drainage, new technology, and more extensive use of capital inputs.

In a study of the Puget Sound and Adjacent Waters Area (Washington), it was determined that a broad range of agricultural products is produced, but most of the farm output is accounted for by a few major commodities, such as milk, eggs, vegetables, berries, and broilers. Recent estimates of agricultural activity in the area indicate that significant increases in production are anticipated for these major commodities. The most significant increase is expected to be in vegetable production (about 250 percent from 1963 to 2020). The total value of crop and livestock is projected to increase from $128 million in 1963 to $165 million in 1980 (29 percent). The production of livestock products is expected to be the dominant industry in agriculture. The area's projected estimates indicate that the total value of livestock products should be nearly $125 million in 1980.

5. Southern:

The USDA report on the Sunflower Basin (Miss.) is nearing completion. This study extracted results from an analysis done on a larger region, with some interesting results. The area would be substantially affected by resource development programs. That land which is most responsive to development (clayey, wet soils) is expected to become more intensively farmed; but as a result, other areas will lose net income if one assumes no improved comparative advantage of the broader areas as a result of development. There are many problems that need to be analyzed concerning the purpose, scale, location, and timing of alternative resource developments.

The Arkansas Basin multipurpose study is essentially completed. Linear programming was not used on this study, but most of the program inputs were used in estimating the impacts of activities on the Arkansas River. However, it was difficult to project future land uses consistent with aggregate

demand estimates. Current land use patterns by soil resource groups were used as the basis for future land use patterns. The major conclusion of the study was that production is decreased by taking land out for navigation pools, but this loss is partially compensated by the positive effects of raised water tables, and is further offset by remaining possible upstream watershed developments.

Emphasis on the St. Francis Basin (Ark.) has been on accumulation of secondary economic data for inputs to the linear programming model. The model will be operational shortly. The unique aspect of this study, along with the Bayou Meto Basin study, is that the program inputs are being developed for the basin and the Arkansas State model simultaneously.

6. Southwestern:

In the four comprehensive framework studies in the Pacific Southwest (California, Great Basin, Lower Colorado, Upper Colorado), preliminary economic base reports have been prepared presenting the projections of economic activity and the input-output models for the regions. However, the economic evaluation of alternative resource developments has not yet been completed. First, other planning agencies will need to identify the alternatives for which an economic evaluation should be made. Several plans will be developed based on the OBERS baseline projections, and adjusted baseline projections based on alternative assumptions or objectives.

The California North Coast Study has been expanded to add to Glen Complex, and additional work will be undertaken to determine the economic impacts of alternative resource developments in the basin. An interindustry model (I-O) will be used to perform the impact analysis. ERS has also been developing correlations between sediment loads and fish production.

As part of a national effort to provide data for a nationwide economic base study for use in comprehensive river basin studies, a set of economic projections were developed for the Great Basin Region for the years 1980, 2000, and 2020. The projections assumed that future national production is in balance with demand. The projections are based on historical trends, current relationships, and evaluation of foreseeable developments. These data and projections, together with some supplementary materials, were the basis for a projected interindustry (I-O) transactions table for the region. The projected transactions tables show total gross output, final demand, and interindustry requirements for the three projection target dates. Manufacturing is projected to continue to contribute the largest share of regional product, apart from final demand, followed by services. Wholesale and retail trade continues to provide a large percentage of regional product. The final demand elements of regional product are projected to contribute an increasing share of regional product.

The major portion of the value of output of the livestock sector is projected to be exported throughout the projection period, while in both poultry and dairy and the crops sectors, interindustry requirements account for most of the value of output. An increasing share of output of the forestry sector will enter final demand. Significant increases in pulpwood

harvest is projected, although pulpwood processing is projected to be outside the region.

Major Service Activities

In addition to the specific contributions to river basin studies, Division staff serve on numerous field task forces and committees. In some instances, staff serve as chairmen, or assume leadership responsibilities, of committees and task force groups dealing with economic projections, plan formulation, water-related land use management, recreation, and report preparation. In addition, they represent ERS as members of USDA Field Advisory Committees for each comprehensive river basin study.

Division staff also provide service to Federal and State agencies, universities, regional and national commissions, and the general public. This service includes supplying statistical data, preparation of published and unpublished economic reports, and consultation on a variety of problems related to the work assignments. Example of the kinds of work and information supplied are: (1) Basic land inventory data, including major land uses, cropping patterns, yields, fertilizer applications, and water use; (2) historical agricultural data concerning the volume and value of production, land use, income, employment, and population; (3) projections of agricultural output by commodity, resource use, crop yields, feeding efficiencies and rations, income, employment, and population; (4) consultation on input data, analytical systems such as linear programming and input-output models; and (5) historical and projected data on population, personal and per capita income, earnings, and employment by sectors.

Future Plans

Program planning and budgeting for comprehensive river basin studies is done annually in cooperation with the Soil Conservation Service and the Forest Service, and is coordinated between the Department of Agriculture and other Federal Departments under the guidance of the Water Resources Council. Changes in the ERS program include participation in a Westwide Water Survey which is being carried out under the overall direction of the Bureau of Reclamation, and completion of several framework studies. Initiation of several comprehensive river basin studies is expected but is contingent upon funding becoming available.

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NATIONAL-INTERREGIONAL ANALYSIS AND PROJECTIONS

Objectives

The objective of the National-Interregional Analysis and Projections (NIRAP) project is to provide a generalized plan for analyzing national and regional potentials for developing water and related land resources. Within this overall framework, specific objectives are to:

Develop a bank of data related to natural resources and provide systems for processing the data;

Prepare a set of baseline projections of likely agricultural production patterns, resource use, and economic activity in the agricultural sector of the economy of water resource regions consistent with a national framework of projected economic activity; and

Develop an operational analytical system with the ability to analyze interregional effects of alternative regional water resource development proposals.

Summary of Progress

Through fiscal 1970, progress was made toward meeting all three of the above objectives. The data bank contains data for all counties in the Nation from the Agricultural Censuses of 1949, 1954, 1959, and 1964. The retrieval system is designed to cluster the county census data and relate summarized data to larger parent areas. The system is now operational. Other items included in the data bank are State estimates of crop acreages and production, and livestock numbers and production for the period 1939 to 1969, although an efficient processing system for these data remains to be accomplished. Data for 48 States from the Conservation Needs Inventory are also included in the system.

The accomplishment of the second and third objectives is interrelated since the analytical system, and its data base, is used to establish the baseline projections. Progress made on these activities includes:

1. Completion of a consistent inventory of the agricultural land base, with estimates of cropping patterns, yields, and fertilizer use on irrigated and nonirrigated soil groups for the 48 States. These data are a primary input to the analytical system.

2. Projections of crop yields and associate fertilizer use for all crops on soil groups within land resource groups were completed for the years 1980, 2000, and 2020.

3. Budgets reflecting the cost of crop production were completed for each of the crops on each soil group within the land resource regions.

4. A national framework of projected commodity requirements to be produced from the Nation's agricultural resources, including projection of livestock feeding rates by class of livestock, was completed.

5. The data (land base, projected yields and fertilizer, crop production costs, and projected commodity requirements) were utilized in a minimum-cost linear programming model to produce projections of land use and production by crop for land resource groups for the years 1980, 2000, and 2020. These projections were compared with historical acreages and production, and, where appropriate, revisions were made.

6. Initial projections of livestock production by class of livestock within land resource groups for the years 1980, 2000, and 2020 were completed and the livestock feed balances adjusted.

7. The projected crop and livestock production of each land resource group was evaluated, and served as the basis for generating consistent farm employment and value of production projections for each land resource group. These employment and earnings projections were transformed into a series compatible with definitions used by the Office of Business Economics.

8. The OBE agricultural employment and earnings series was transformed into projections for 1980, 2000, and 2020 for OBE Economic Areas, Water Resource Regions, and Water Resource Sub-Areas.

Major Service Activities

The staff assigned to NIRAP are essentially committed to the accomplishment of the basic project objectives, which include the preparation of a report on the projections for use by the Water Resources Council and related agencies. Capability is being developed to service requests by agencies regarding the use of the projections prepared. Service-type requests during fiscal 1970 were generally limited to consultation with division staff regarding the utilization and compatibility of NIRAP projections to existing field studies.

Future Plans

The NIRAP system is planned and carried out in cooperation with the Office of Business Economics, U.S. Department of Commerce. Analyses and projections of agricultural production and resource use are prepared for the Water Resources Council, and for USDA contributions in comprehensive water resource planning. Thus, program plans for NIRAP must be responsive to the needs of cooperating agencies, as well as to the needs of the Division for carrying out its program. Within the program of the Division, it is expected that greater use can be made of the NIRAP model and data for regional and national analyses of program and production alternatives. The role of this kind of analytic system in the Division's total program, relative to other kinds of program inputs, should be more clearly determined as a result of reviews undertaken in the current year.

RESOURCE CONSERVATION AND DEVELOPMENT PROGRAM SUPPORT

Objectives

The overall objective of the RC&D program is "to expand the economic opportunities for the people of an area by developing and carrying out a plan of action for the orderly conservation and improvement, development and wise use of their natural resources." Within this broad objective, ERS provides technical assistance and conducts studies of economic feasibility and impact in accordance with annual work plans prepared under a Memorandum of Agreement with the Soil Conservation Service.

During the year, relative emphasis among the program activities was reoriented, leading to reduction in the amount and types of support provided directly to local projects, and to increased effort on specific economic studies of project proposals having general implications beyond any individual project area. The program consists of the following activities:

Economic studies of project proposals having implications beyond the project area;

Technical assistance through the assembly and analysis of socioeconomic data to be used as inputs for formulating the economic aspects of RC&D project plans; and

Assistance in program planning and development at the national level.

Summary of Progress

During the year, some form of technical assistance and supporting studies were provided for 12 RC&D projects newly authorized for planning, as well as some continuing assistance to 56 operational projects. A summary of this activity follows.

1. Supporting Studies:

Support is provided through basic information studies designed to measure the effects of RC&D programs in the immediate program area and beyond. The studies consider changes in the market situations, as well as changes in socioeconomic relationships. In most cases, these studies are either feasibility or local impact studies, pertaining to specific measures or proposals which would result in substantial changes in existing patterns of land and water use.

A study of factors associated with RC&D project measures adoption was initiated in the North Central Resource Group. This study will develop information helpful to local planners in selecting future project measures. More specifically, this study will focus on underlying factors influencing decisions by local planners in their choices of project measures for implementation. A questionnaire is being prepared to collect this data.

A study was initiated in the Southern Resource Group of critical economic relationships in a local RC&D economy. The approach is to analyze the economic structure of an RC&D area, and to determine important relationships between resource-dependent industries and other economic activities. An input-output model is being prepared to test basic data which will be collected by a survey. Another study in the region is obtaining production cost and management information on catfish production. A questionnaire for a mail survey was drafted for review and approval.

A preliminary analysis was made of the economic impact from developing four proposed multipurpose sites on the West Branch of the Delaware River in Delaware County, New York. The primary inquiry related to construction of flood-prevention structures designed with 100-year flood frequency expectation. Preliminary results indicated the long-run economic impact of the development of the sites was practically nil if designed only to meet 100-year flood needs and incidental recreation uses usually associated with such structures. If structures are built for 100-year frequency floods, the total impact on the community may actually represent a net loss to the community unless additional adjacent land is developed to replace the economic activity displaced by the impoundment.

2. Technical Assistance in Formulating Project Work Plans:

Technical assistance is provided in the project planning stage through the assembly and analysis of basic socioeconomic data. During FY 1970, 21 economic profiles of socioeconomic data were assembled and distributed to newly authorized projects and established projects updating their plans. During FY 1970 as in 1969, ERS was greatly assisted by use of the economic data from the EDA data bank in the Department of Commerce.

3. Program Assistance at the National Level

Staff work was carried out in cooperation with SCS personnel, and a number of RC&D project work plans were reviewed and comments were provided. Supporting economic information, analysis, and RC&D project review was provided in response to specific and general inquiries by SCS and other concerned Federal agencies. During the year, a number of inquiries were received and handled.

While some work was done in studying the appropriate conditions for and the general usefulness of multipliers in the RC&D program, a more pressing topic related to the issue of evaluating economic growth in 20 selected RC&D areas. Significant amounts of support were given SCS and the PEP staff in estimating economic outputs of these RC&D projects since their inception. Such measures as changes in long-term employment, changes in income, and utilization rates of other programs promoting a balanced program of development and conservation were examined, and changes attributable to the RC&D program were determined.

The most significant finding of this evaluation was the relative position of the projects in terms of three economic indicators, i.e., labor force, per household income, and retail sales. While 70 percent of the projects

experienced increases in numbers of their labor forces, less than half of the RC&D counties experienced increases in per household income or retail sales. An obvious conclusion is that a sizable number of RC&D areas contain counties having low growth conditions. The reasons for this are subtle and varied, and there is no absolute basis for predicting that present low growth potential will continue or that a future "take off" is not imminent. The growth potentials of the areas have been evaluated almost entirely on the basis of the economic indices previously mentioned. Unfortunately, these statistics tell nothing about the condition of producers' expectations or the pre-conditions for growth in an area's economic infrastructure. These pre-conditions may have already been prepared by the planning incident to the development of an RC&D project.

Major Service Activities

Service and support activities are authorized in the objectives for the program of work, and are described in the preceding section.

Future

Redirection of the Division's RC&D studies during the year eased the pressures of providing on-the-ground support to individual RC&D projects. Also, more adequate ADP support eased efforts to provide individual projects with economic information. It is expected that 15 new projects will be started in 1971, and that as many as 40 economic profiles will be requested for local project use in preparing applications or updating plans.

Support for the RC&D program is based on a recognized need for basic information by planners in different areas of the country. The studies described earlier hopefully will provide structural information to answer a variety of key questions related to prospects for economic growth and effective use of resources located in RC&D areas. This social and economic information is needed for use in structuring the RC&D program in order to achieve Department objectives. Studies of RC&D successes and failures in adopting project measures are needed to evaluate alternative organizational and procedural arrangements. Inventories of project measures and investments in RC&D project areas will be emphasized, and economic and social indicators such as income generated, employment created, conservation attained, and environmental improvements achieved will be analyzed.

III. PROGRAM EVALUATION AND RELATED POLICY STUDIES

WATERSHED INVESTIGATIONS

Objectives

The work program for watershed investigations is planned jointly with the Soil Conservation Service and is carried out through annual work plans prepared in accordance with the provisions of a basic Memorandum of Agreement approved by the Secretary in 1955. This memorandum expressed SCS's desire for specialized assistance from ERS in:

Preparation of Departmental policy;

Economic evaluation of watershed work plans;

Ex post studies of watershed projects;

Special economic evaluation problems; and

Review and analysis of the economic aspects of resource development proposals.

Summary of Progress

1. Watershed Protection Policy:

   Division staff participated in several economic workshops sponsored by the SCS for watershed and river basin planning-party economists. The Division also continued its contribution to development and adaptation of principles, policies, criteria, and procedural guides through its participation on committees and task forces of the Water Resources Council.

2. Inventory and Economic Analysis of Watershed Work Plans:

   The annual inventory of selected statistical data was abstracted from all work plans for small watersheds authorized for operation under P.L. 566 as of June 30, 1969. The computer system employed for this inventory permits the compilation of work plan statistics at several levels of aggregation, including counties, States, and land resource areas. Several summaries of the data were prepared for special purposes and uses. Emphasis in project inventory is on recording the kind and magnitude of estimated flood and erosion damages; anticipated costs of planned land treatment or structures; and estimated benefits from flood and erosion prevention, water management, and water supplies. Some data are developed as averages per acre or per project plan.

3. Evaluation of Upstream Flood Protection in Arkansas-White-Red River Region:

   Progress in FY 1970 was reported in a third supplement to the ERS Series Report 353 published in June 1967, "Evaluating Flood Prevention in Upstream Watersheds with an Areal Point Sample--Interim Report, Arkansas-White-Red Water Resource Regions."

Land Use for the 1966-68 period on the area flooded averaged 52.8 percent in cultivation, 40.2 percent in pasture, and 7 percent in other uses. Land use on the entire flood plain of those watersheds which flooded was very similar. The gross value of production per acre for the area flooded ($42.54), compared with that for the flood plain area ($41.80), suggests there is no significant difference in the income productivity of the two areas.

Flooding occurred on 35 of the 56 sample watersheds over the period 1966-68. Inundation averaged 104,800 acres a year, ranging from a low of 38,160 acres in 1966 to a high of 172,760 acres in 1968. Flood damage to crops and pastures averaged $635,096 for the study period, with damaging floods reported by farmers on 31 watersheds. Damage per acre flooded was $4.81 in 1966, $7.02 in 1967, and $5.76 in 1968.

4. Correlation of Flood Damages with Alternative Land Use Systems:

This work was concluded in FY 1970. The principal objective of the study was to develop a general model for estimating average annual flood damages to crops and pastures on any specific area within a Soil Conservation Service project-size watershed. While the general model was developed as a simulation program, it incorporates many of the conventional planning procedures employed by SCS watershed planners.

The studies indicated that care should be exercised in the method used to measure flood protection benefits. It may appear reasonable to consider flood protection benefits as the difference between net returns for present land use with no protection, and net returns for the optimum land use with protection. This figure would not be accurate, however, since flood plain net returns can often be increased without additional flood protection. Perhaps the most reasonable interpretation is that the difference between net returns for present land use with and without flood protection is an estimate of the minimum benefits expected from flood protection, while the difference between net returns for the optimum land use with and without flood protection is an estimate of the maximum benefits expected from flood protection. In the Nuyaka Creek flood plain, the increase in expected net returns for appropriate land use changes exceeds the benefits of flood protection.

5. Economic Impacts of Watershed Projects:

Work is in progress in five study areas. An analysis of selected economic census data in multicounty areas of 10 southern States will identify the contribution of watershed projects to economic growth. For one study being done in Florida, a regression model was formulated which relates employment effects to watershed project investments. A similar study (also in Florida) is developing methods to relate economic effects of P.L. 566 watershed projects to regional objectives of improved income, employment, and income distribution.

For a third study in Florida, data were assembled to compare the impacts of watershed development spending in two counties having greatly different

economic situations. This comparison is testing the hypothesis that project effects are greater on a county having low income and employment.

Report was received of a study at Pennsylvania State University presenting a method for modifying benefit evaluation for small watershed projects to reflect levels of income of beneficiaries. A nontechnical summary will be prepared for the possible use of SCS personnel.

Administrative reports have been received for studies of the economic impacts from two completed watershed projects in Colorado. Both studies used the input-output model developed for study of the Great Plains Conservation Program to evaluate the impacts of project expenditures and after-construction benefits.

Major Service Activities

Service and support activities are authorized in the programmed work and are described in the preceding section.

Future Plans

In line with the broadened objectives for resource development, greater emphasis in studies will be given to the contribution of small watershed projects to meeting local goals for economic and social growth and environmental improvement. Two studies have been proposed which will expand program evaluation efforts. Case studies of six completed projects will provide comparisons of expected versus actual contributions of these projects to community development. This study would be intended to provide guides for orienting the watershed program needs and objectives of rural development. Another proposed study will identify opportunity costs of environmental quality objectives for watershed projects. Initial efforts will be to identify critical environmental concerns which then can be formalized as operational goals for watershed development.

Publications

*BACK, W. B. and KASAL, JAMES. Estimating Local Economic Impacts of the Wray Watershed Project. Econ. Res. Serv. Lincoln, Neb. 11 pp. 1970.

*BLOOD, RICHARD A. Watershed Project Evaluations in Six Mile Creek, Arkansas. ERS in coop. with SCS. Adm. report printed in Little Rock. 34 pp. Feb. 1970.

*ECONOMIC RESEARCH SERVICE. Benefits and Costs of Small Watershed Development: A Staff Report on Projects Approved to July 1969 under Public Law 83-566. 25 pp. ERS in coop. with SCS. April 1970.

*KASAL, JAMES. An Analysis of Economic Impacts of the Big Sandy Creek Watershed. 10 pp. 1970.

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* Prepared in limited number for use by cooperating Federal and State agencies or prepared jointly with other Federal and State agencies for comprehensive river basin studies.

LACEWELL, RONALD D. and EIDMAN, VERNON R. Using Computers to Help Evaluate Flood Protection Measures. Oklahoma Current Farm Econ. Agr. Res., Vol. 42, No. 2: pp. 5-11. Dec. 1969.

SLOGGETT, GORDON. Evaluating Flood Prevention in Upstream Watersheds with an Areal Point Sample: Interim Report, Arkansas-White-Red Water Resource Regions. Supp. 3 to ERS-343: 16 pp. June 1970.

SLOGGETT, GORDON. Irrigation from Upstream Watershed Detention Reservoirs in Oklahoma. Okla. State Univ. Agr. Expt. Sta. (in coop. with ERS) Progress Report P-631: 19 pp. April 1970.

SLOGGETT, GORDON. Mule Creek, Iowa: Watershed Improvement Evaluation Report. 28 pp. Aug. 1969.

WOODS, HAROLD. Upper Rio Hondo Evaluation Report. Administrative report, Econ. Res, Ser. Little Rock, Ark. 47 pp. Aug. 1969.

RELATED POLICY ASSISTANCE AND STUDIES

A portion of the Division's program consists of special studies, and task force activities immediately concerned with policy formulation and program development or evaluation. Some of the more important of these activities carried out in the past year are summarized below.

1. WRC Task Force on Evaluation Procedures:

Division personnel participated in a task force established by the Water Resources Council to devise a broader basis for formulating and evaluating proposed public investment in water resource use and development.

A system of accounts was developed to identify and display the beneficial and adverse effects of a proposed project or area plan toward four broad objectives: (1) national economic development; (2) environmental quality; (3) quality-of-life; and (4) regional development. Assistance was provided to a test team that conducted several field tests of the proposed planning guidelines to determine their applicability in an actual planning setting. Two key documents prepared by the task force, "Principles for Planning Water and Land Resources," and "Standards for Planning Water and Land Resources," contain the results of the deliberations of the task force. These documents were recommended to supercede Senate Document 97, which is the current water resource planning guideline for Federal agencies.

2. AID Review and India Land Reform Study

The Division performed a major services task in the field of agrarian reform. Assistance was provided to AID in planning the 1970 Spring Review on Land Reform; a country paper, "Land Reform in India," prepared for the review, was published and distributed by AID. Discussion was prepared for a special seminar on land reform and employment in India, also conducted by AID.

Under the auspices of USAID in New Delhi, a review and first-hand observation of land reform implementation was completed. A report covering land reform, land prices, and land records was prepared and transmitted to AID.

3. Departmental Task Force Participation

Division personnel contributed to numerous task forces concerned with revision of the Committee on Water Resources Research long-range plan for water research. Subject areas considered were improving water resources system planning and management processes, control of sediment, water quality, meeting increased water supply requirements, mitigating water-caused damages, conserving ecological values in water resource planning, and metropolitan area water systems.

4. Staff Support for Environmental Quality Activities

The number and complexity of requests for information related to water quality, animal waste, land use, and other environmental concerns increased during the year. The inquiries originated from needs of the Department's Environmental Quality Executive Committee and the Council on Environmental Quality. Materials prepared by the Division included, in addition to items of a routine nature, information and data for use by CEQ in preparing its first annual report, "Environmental Quality." Other major activities included review of legislation and preparation of material on land use information, and review of environmental statements prepared for CEQ by Federal agencies.

5. Report Reviews

Reviews were completed and comments prepared for 19 Corps of Engineers projects, including three environmental statements and six Department of the Interior projects. Comments are transmitted to the Soil Conservation Service for use in preparing a Department statement, which is then forwarded to the Secretary of the originating Department. The Division initiated and sent to the Bureau of the Budget three legislative reports, and two legislative reports were prepared at the request of a congressional committee. Nine legislative reports were also prepared and reviewed by the Division in cooperation with other Federal agencies.

6. Multiple Use Management of Public Lands

A planning system design team, organized by the Bureau of Land Management and including an economist from the Division, was awarded a Unit Citation from the Secretary of the Interior for "excellence of service and superior achievement in the development of procedures for the Bureau Planning System." The award was made at the completion of the design phase of a multiple use management plan developed for the Bureau for use on public lands under its jurisdiction. The plan is now being implemented on a pilot basis throughout BLM's management districts.

7. Flood Control Benefit Evaluation Techniques

The probable effects of two flood control reservoirs on agricultural land use and production in the Wabash River Basin (Indiana) was analyzed in a study sponsored by the Corps of Engineers. The analysis was based on a least-cost linear programming model of the agricultural sector of the Wabash Basin. Land receiving flood protection benefits from the proposed reservoir was specifically identified within the model. It was estimated that, by 1980, the two reservoir projects would result in an annual savings of agricultural production costs within the Basin of $218,100. About 8,300 acres of flood plain lands would be converted to higher uses as a result of the flood protection, and an additional 60,200 acres would be cropped more intensively. In other parts of the Basin, however, 9,800 acres would be idled as a result of the change in comparative advantage.

8. Water Constraints on Agriculture--Colorado River Basin:

A cooperative study carried out in six subbasins of the Colorado River analyzed basic industries and their relationships in 1960, and made projections of economic activity for 1980 and 2010 as a framework for evaluating water quality decisions. The 1960 Basin population of 1.8 million is expected to rise to 4.8 million by 1980 and to 8.5 million by 2010. During the 50-year period, irrigated cropland is projected to increase by 10 percent, gross output of the processing sectors will be seven times the 1960 output, and gross agricultural output will more than double. Agriculture accounted for 97 percent of all water depletion in 1960. The projected share for 2010 is 84 percent; this marked decrease would result largely from the increase in population and economic activity projected mainly in the Phoenix area, where there will probably be a curtailment of irrigated agriculture. Sufficient water is expected to be available in the six subbasins to sustain the economic activity projected for 1980 and 2010. Water quality will likely decrease, however, especially in southeastern Arizona, resulting in considerable direct and indirect monetary loss to agriculture.

9. Census Support:

Six NRE staff assisted the Bureau of the Census with the Census of Irrigation. This activity included assistance by one staff member in evaluating the results of pre-test surveys and in developing the final questions to be included on the census questionnaire. Also, five staff members were involved for three weeks each in assisting with the enumeration of multibasin and the larger, more complex single-basin irrigation water supply organizations.